FORM PTO-1390 (REV 11-98) | U S DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER	U S APPLICATION NO. (If known, see 37 CFR 1.5)
35265/1:1	09/463557

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/IL98/00342	July 23, 1998	July 24, 1997

TITLE OF INVENTION: SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

APPLICANT(S) FOR DO/EO/US: Nir Bar Natan, Jonathan Bassan, Oren Grozovik, and Shai Waisel

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. [X] This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. [ ] This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. [ ] This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).
4. [X] A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date.
5. [X] A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. [X] is transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] has been transmitted by the International Bureau.
   c. [ ] is not required, as the application was filed in the United States Receiving Office (RO/US).
6. [ ] A translation of the International Application into English (35 U.S.C. 371(c)(2)).
7. [X] Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. [ ] are transmitted herewith (required only if not transmitted by the International Bureau).
   b. [ ] have been transmitted by the International Bureau.
   c. [ ] have not been made; however, the time limit for making such amendments has NOT expired.
   d. [X] have not been made and will not be made.
8. [ ] A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. [X] An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)). (unsigned)
10. [ ] A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11. to 16. below concern document(s) or information included:

11. [ ] An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. [ ] An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. [X] A FIRST preliminary amendment.
    [ ] A SECOND or SUBSEQUENT preliminary amendment.
14. [ ] A substitute specification.
15. [ ] A change of power of attorney and/or address letter.
16. [X] Other items or information:
    1. Copy of International Publication No. WO 99/05816 (February 4, 1999);
    2. International Search Report (copy); and
    3. Written Opinion (copy).

420 Rec'd PCT/PTO 24 JAN 2000

U.S. APPLICATION NO (if known, see 37 CFR 1.5)	INTERNATIONAL APPLICATION NO	ATTORNEY'S DOCKET NUMBER
09/463557	PCT/IL98/00342	35265/1:1

17. [X] The following fees are submitted:	CALCULATIONS PTO USE ONLY	
BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)):		
Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO **$970.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO **$840.00**		
International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO **$760.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4) **$670.00**		
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4) **$96.00**		
ENTER APPROPRIATE BASIC FEE AMOUNT =	$ 670.00	
Surcharge of **$130.00** for furnishing the oath or declaration later than [ ] 20 [X] 30 months from the earliest claimed priority date (37 CFR 1.492(e)).	$ 130.00	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	20 - 20 =	0	X **$18.00**	$ 0.00	
Independent claims	2 - 3 =	0	X **$78.00**	$ 0.00	
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			+ **$260.00**	$ 0.00	
TOTAL OF ABOVE CALCULATIONS =				$ 800.00	
Reduction of 1/2 for filing by small entity, if applicable. A Small Entity Statement must also by filed (Note 37 CFR 1.9, 1.27, 1.28).				$	
SUBTOTAL =				$ 800.00	
Processing fee of **$130.00** for furnishing the English translation later than [ ] 20 [ ] 30 months from the earliest claimed priority date (37 CFR 1.492(f)). +				$	
TOTAL NATIONAL FEE =				$ 800.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property +				$	
TOTAL FEES ENCLOSED =				$ 800.00	
				Amount to be: refunded	$
				charged	$

a. [X] A check in the amount of $ 800.00 to cover the above fees is enclosed.

b. [ ] Please charge my Deposit Account No. _____ in the amount of $_____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. [X] The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. 19-4455. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO
Paul S. Angello
Stoel Rives LLP
900 SW Fifth Avenue, Suite 2600
Portland, Oregon 97204-1268
Telephone: (503) 224-3380
Facsimile: (503) 220-2480

Paul S. Angello
SIGNATURE

Paul S. Angello
NAME

30,991
REGISTRATION NUMBER

Prior Foreign Application(s)			Priority Claimed
PCT/IL98/00342 (Number)	PCT (Country)	23 July 1998 (Day/Month/Year Filed)	[X] Yes [ ] No
			Priority Claimed
121389 (Number)	Israel (Country)	24 July 1997 (Day/Month/Year Filed)	[X] Yes [ ] No

I hereby claim the benefit under Title 35, United States Code, § 119(e) of any United States provisional applications(s) listed below:

None.

I hereby claim the benefit under Title 35, United States Code, § 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code § 112, I acknowledge the duty to disclose information that is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 that became available between the filing date of the prior application and the national or PCT international filing date of this application.

Prior Foreign Application(s)			Priority Claimed
PCT/IL98/00342 (Number)	PCT (Country)	23 July 1998 (Day/Month/Year Filed)	[X] Yes [ ] No
			Priority Claimed
121389 (Number)	Israel (Country)	24 July 1997 (Day/Month/Year Filed)	[X] Yes [ ] No

AUG 2000
3557

Attorney Docket No.: __________

Applicant or Patentee: **Nir BAR NATAN**
Application or Patent No.:
Filed:
Title: **SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. 1.9(f) and 1.27(b)) INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

described in:
[ ] the specification filed herewith
[ ] application no.: __________ filed __________
[ ] patent no. __________ issued __________

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

[ ] no such person, concern, or organization
[X] persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 C.F.R. 1.27)

FULL NAME **Wondernet Ltd.**
ADDRESS **111 Cahanman Street, Benei Brak 51553, Israel**
[ ] individual [X] small business concern [ ] nonprofit organization

FULL NAME __________
ADDRESS __________
[ ] individual [ ] small business concern [ ] nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR: **Nir BAR NATAN**
RESIDENCE: **Ganei Tikvah, Israel**

50 Harel Yehudah Street, Apt. 5, Ganei Tikvah 55900, Israel
(Post Office Address) (City) (State & Zip Code/Country)

Signature: __________ Date: 11/5/00
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Attorney Docket No.: _____

Applicant or Patentee: **Jonathan BASSAN**
Application or Patent No.:
Filed:
Title: **SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. 1.9(f) and 1.27(b)) INDEPENDENT INVENTOR

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SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

described in:

[ ] the specification filed herewith
[ ] application no.: _____ filed _____
[ ] patent no. _____ issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

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[X] persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 C.F.R. 1.27)

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ADDRESS **111 Cahanman Street, Benei Brak 51553, Israel**

[ ] individual [x] small business concern [ ] nonprofit organization

FULL NAME _____
ADDRESS _____

[ ] individual [ ] small business concern [ ] nonprofit organization

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR: **Jonathan BASSAN**
RESIDENCE: **Ramat Hasharon, Israel**

2 Hanoter Street, Ramat Hasharon 47210, Israel
(Post Office Address) (City) (State & Zip Code/Country)

Signature: X J. Bassan Date: 13.8.2000

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Attorney Docket No.:_____

Applicant or Patentee: **Shai WAISEL**
Application or Patent No.:
Filed:
Title: **SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. 1.9(f) and 1.27(b)) INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

described in:

[ ] the specification filed herewith
[ ] application no : _____ filed _____
[ ] patent no. _____ issued _____

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[X] persons, concerns or organizations listed below*

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FULL NAME **Wondernet Ltd.**
ADDRESS **111 Cahanman Street, Benei Brak 51553, Israel**

[ ] individual [x] small business concern [ ] nonprofit organization

FULL NAME _____
ADDRESS _____

[ ] individual [ ] small business concern [ ] nonprofit organization

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR: **Shai WAISEL**
RESIDENCE: **Petach Tikvah, Israel**

6 Hazait Street, Petach Tikvah 49214, Israel
(Post Office Address) (City) (State & Zip Code/Country)

Signature: _____ Date: 13.8.2000

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Attorney Docket No.: _____

Applicant or Patentee: **Oren GROZOVIK**
Application or Patent No.:
Filed:
Title: **SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES**

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. 1.9(f) and 1.27(b)) INDEPENDENT INVENTOR

As a below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 C.F.R. 1.9(c) for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled:

SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

described in:

[ ] the specification filed herewith
[ ] application no.: _____ filed _____
[ ] patent no. _____ issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 C.F.R. 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

[ ] no such person, concern, or organization
[X] persons, concerns or organizations listed below*

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 C.F.R. 1.27)

FULL NAME **Wondernet Ltd.**
ADDRESS **111 Cahanman Street, Benei Brak 51553, Israel**

[ ] individual [x] small business concern [ ] nonprofit organization

FULL NAME _____
ADDRESS _____

[ ] individual [ ] small business concern [ ] nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF INVENTOR: **Oren GROZOVIK**
RESIDENCE: **Tel Aviv, Israel**

12 Lamdan Street, Tel Aviv 47210, Israel
(Post Office Address) (City) (State & Zip Code/Country)

Signature: X _____ Date: 13.8.2000
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Applicant or Patentee: BAR NATAN, Nir et al
Serial or Patent No.:
Filed or Issued:
For: SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY STATUS (37 C.F.R. 1.9(f) and 1.27(c)) SMALL BUSINESS CONCERN

I hereby declare that I am:
[ ] the owner of the small business concern identified below:
[ ] an official of the small business concern empowered to act on behalf of the concern identified below:

NAME OF CONCERN: **Wondernet Ltd.**
ADDRESS OF CONCERN: **111 Cahanman Street**
Bene Brak 51553, Israel

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 C.F.R. 121.3-18, and reproduced in 37 C.F.R. 1.9(d), for purposes of paying reduced fees under Section 41(a) and (b) of Title 35, United States Code, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention, entitled:

SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

by inventor(s): **Nir BAR NATAN, Jonathan BASSAN, Oren GROZOVIK and Shai WAISEL**

described in:
[ ] the specification filed herewith;
[ ] application serial no. _____ filed _____
[ ] patent no. _____ issued _____.

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 C.F.R. 1.9(d) or by any concern which would not qualify as a small business concern under 37 C.F.R. 1.9(d) or a nonprofit organization under 37 C.F.R. 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 C.F.R. 1.27)

FULL NAME (none)

ADDRESS

[ ] individual [ ] small business concern [ ] nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 C.F.R. 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any parent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING: Jonathan Bassan
TITLE OF PERSON OTHER THAN OWNER: VP Marketing
ADDRESS OF PERSON SIGNING: Ramat Hasharon, Israel

SIGNATURE X J. Bassan

DATE 13.8.2000

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of

Group Art Unit:

Nir Bar Natan, Jonathan Bassan, Oren Grozovik, and Shai Waisel

Application No.

Filed:

For: **SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES**

Date: January 24, 2000

PRELIMINARY AMENDMENT

TO THE ASSISTANT COMMISSIONER FOR PATENTS:

Please amend the above-identified application as follows.

In the Drawings:

In Fig. 5, change "records?" to --vectors?-- at the place indicated in red ink in decision block 60 on the enclosed photocopy of Fig. 5.

In Fig. 6, add reference numerals 70, 72, 74, 76, 78, 80, and 82 at the places indicated in red ink on the enclosed photocopy of Fig. 6.

In the Specification:

Page 1, line 1, after the title of the application insert:

--This application claims priority under 35 USC § 371 from International Application PCT/IL98/00342, with an international filing date of July 23, 1998, which derives priority from Israel Application No. 121389, filed July 24, 1997.--

Page 3, line 16, change "one" to --an alternative--.

Page 6, line 24, change "this" to --these--; and change "The" to --Referring now to Fig. 3, the--.

Page 6, line 25, change "the" to --a--.

Page 7, line 26, change "Fig. 3" to --Fig. 4--.

Page 8, line 7, change "Fig. 4" to --Fig. 5--.

Page 8, line 26, change "(Fig. 3)" to --(Fig. 4)--.

Page 9, line 16, change "Figs. 3 and 4" to --Figs. 4 and 5--.

Page 9, line 27, after "is" insert --so--.

Page 10, line 2, change "Fig. 5" to --Fig. 6--.

Page 10, line 3, change "Fig. 5" to --Fig. 6--.

Page 10, line 12, change "equals" to --equal--.

Page 10, line 21, change "passwork" to --password--.

In the Claims:

Amend claims 1 and 5-7 as follows:

1. (Amended) A system for authenticating a signature including:

(a) a digitizer and an associated [electronic] pen;

(b) a dynamic identification unit for receiving data from said digitizer produced during signature by said [electronic] pen on said digitizer, calculating signature parameters and permitted variations from said data, and generating a reference signature record therefrom;

(c) a comparator for comparing said received parameters produced during signature with said reference signature record; and

(d) apparatus for providing an accept or reject response in accordance with the output of said comparator;

c h a r a c t e r i z e d in that:

said reference signature record is a dynamic personal signature profile that is updated in accordance with received parameters produced during each accepted signature.

5. (Amended) The system according to [any of claims] claim 1 [to 3] for authenticating a signature transmitted over a transmission line, comprising:

(a) a vendor unit including:

(1) a digitizer and an associated [electronic] pen; and

(b) a signature authorization unit coupled to said vendor unit by the transmission line and including:

(1) a dynamic identification unit for receiving data from said digitizer produced during signature by said [electronic] pen on said digitizer,

calculating signature parameters therefrom, and generating a reference signature record corresponding thereto;

(2) a comparator for comparing said parameters produced during signature with said reference signature record; and

(3) apparatus for providing an accept or reject response to said vendor unit in accordance with the output of said comparator.

6. (Amended) The system according to claim 2 [or 3] for authenticating a signature transmitted over communication transmission lines, comprising:

(a) a cardholder unit including:

(1) a digitizer and an associated [an electronic] pen;

(2) apparatus for transmitting the output of said digitizer over the communication transmission lines;

(b) a signature authorization unit including:

(1) a dynamic identification unit for receiving data from said digitizer produced during signature by said [electronic] pen on said digitizer, calculating signature parameters therefrom, and generating a reference signature record corresponding thereto;

(2) a comparator for comparing said parameters produced during signature with said reference signature record; and

(3) apparatus for providing an accept or reject response in accordance with the output of said comparator; and

(c) a vendor unit coupled to said cardholder unit and to said signature authorization unit by the communication transmission lines and including a transceiver for receiving said output of said digitizer from said cardholder unit and transmitting it to said signature authorization unit; and for receiving said accept or reject response from said signature authorization unit.

7. (Amended) The system according to [any of the preceding claims] claim 1, wherein said reference signature record includes an array of signature parameters and permitted variations.

Cancel claim 8.

Amend claim 9 as follows:

9. (Amended) A method of authenticating a signature including the steps of:

(a) providing a reference signature record;

(b) signing with [an electronic] a pen on a digitizer tablet;

(c) calculating signature parameters from data received from said digitizer produced during signature by said [electronic] pen on said digitizer;

(d) comparing said parameters produced during signature with said reference signature record; and

(e) providing an accept or reject response in accordance with results of the comparison;

c h a r a c t e r i z e d in that:

said step of providing a reference signature record includes dynamically updating a personal signature profile, which constitutes said reference signature record, in accordance with received parameters produced during each accepted signature.

Cancel claim 12.

Add the following claims:

--13. The system according to claim 1, wherein said personal signature profile includes an array of parameters and personal tolerances based on received parameters produced during a plurality of accepted signatures.--

--14. The system according to claim 13, wherein said personal tolerances are determined individually for each person in accordance with variations in received parameters produced during each accepted signature of that person.--

--15. The system according to claim 1, wherein one of said parameters is pen tilt angle.--

--16. The system according to claim 1, wherein said comparator is arranged to provide a reject response when a signature is identical to an immediately previous signature.--

--17. The system according to claim 1, wherein said apparatus for providing an accept or reject response includes apparatus granting or denying access to network resources.--

--18. The method according to claim 9, wherein one of said parameters is pen tilt angle.--

--19. The method according to claim 9, further including the step of providing a reject response from said comparator when a signature is identical to an immediately previous signature.--

--20. The method according to claim 9, wherein said step of comparing signature parameters can be performed on parameters received from the digitizer tablet at any orientation and size of signature relative to said tablet.--

--21. The method according to claim 9, wherein said step of calculating signature parameters can be performed on parameters received from the digitizer tablet at any orientation and size of signature relative to said tablet.--

--22. The method according to claim 9, wherein said step of providing an accept or reject response includes granting or denying access to network resources.--

REMARKS

Claims 1-7, 9-11, and 13-22 are in the application, of which claims 1 and 9 are in independent form.

The amendment to Fig. 5 corrects an obvious typographical error, and the amendments to Fig. 6 insert inadvertently omitted reference numerals to which the specification refers at page 10.

The amendments to the specification clarify the descriptions presented and correct erroneous references to certain drawing figures.

The amendments to the claims recast them to comply with the formal standards of U.S. patent practice and define their scope of coverage preparatory to examination.

Applicants present claims 1-7, 9-11, and 13-22 for examination.

Respectfully submitted,

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SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

FIELD OF THE INVENTION

The present invention relates to a system and method for authenticating signatures in general and, in particular, to a system and method for authenticating signatures transmitted over digital communication lines.

BACKGROUND OF THE INVENTION

In the field of computer graphics, it is known to use a digitizer to convert graphical data into electronic data for a computer. A user draws with an electronic pen on the digitizer tablet, and the digitizer converts the graphical data to electric signals. Such digitizers are used today for inputting data to computers, similar to a mouse.

There are many occasions in which it is necessary to authenticate the signature of a person signing a document in order to ensure that the signatory is indeed the person whose name is being signed. One particular application is the field of credit cards, wherein sums of money change hands in reliance on the signature of the card holder. In the event that a card is stolen, a person who can forge the cardholder's signature can charge items against the cardholder's bank account. Similarly, when purchases are made over the telephone, the number and expiration date of the card are read to the vendor, but there is no way to verify whether the caller is an authorized user of the card.

This problem has reached new heights with the advent of the Internet, where sales are transacted by means of transmitting the number and expiration date of the credit card only, without any means of verifying the origin of the purchase. Since these communication lines are open, it is easy for a hacker to determine the number and expiration date of someone else's credit card which were transmitted over his modem, and to use that credit card for unauthorized purchases.

Authentication of signatures by means of a graphical image (or bitmap) is not a solution because a photocopy of the signature looks authentic and cannot be detected.

Accordingly, there is a long felt need for and it would be very desirable to have a method of authenticating the signature of a person, particularly a person using a credit card, both in a conventional sales transaction in a store, and over transmission lines, such as the Internet.

SUMMARY OF THE INVENTION

According to the present invention, there is provided a system for authenticating a signature including a digitizer, an electronic pen, a dynamic identification unit for measuring vectors produced during signature by the electronic pen on the digitizer, and a comparator for comparing the vectors produced during signature with a reference signature.

According to a preferred embodiment, the system also includes an encryptor for encrypting a signature record and a decoder for decoding the encrypted signature record.

According to another preferred embodiment, the reference signature record is stored on an IC (integrated chip) card.

In accordance with the present invention, there is also provided a method of authenticating a signature including the steps of

providing a reference signature record,

signing with an electronic pen on a digitizer tablet,

calculating parameters from data produced during signing on the digitizer tablet;

comparing the parameters produced during signature with a reference signature record; and

providing an accept or reject response in accordance with results of the comparison.

According to a preferred embodiment, the method also includes the steps of encrypting the calculated parameters

with a encryption key, and decrypting the encrypted data before comparing the parameters.

Further according to a preferred embodiment, the method includes the step of transmitting the calculated parameters over a transmission line to a remote location before the step of comparing.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be further understood and appreciated from the following detailed description taken in conjunction with the drawings in which:

Fig. 1 is a schematic illustration of a signature authentication system according to one embodiment of the present invention;

Fig. 2 is a schematic illustration of a signature authentication system according to one embodiment of the present invention;

Fig. 3 is a flow chart of a method of providing a reference signature according to the invention;

Fig. 4 is a flow chart of a method of authenticating a signature;

Fig. 5 is a detail of a method of comparing the signature in the method of Fig. 4; and

Fig. 6 is a flow chart of a method of updating a reference signature.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a system and method for authenticating signatures, the system and method being suitable also for authenticating signatures transmitted over communication lines. The present invention uses signature vector recognition and is based on the use of a digitizer together with software in a dynamic identification unit which calculates parameters based on data produced during signature by the electronic pen on the digitizer tablet. These

parameters, which are unique to each person when he signs his own name, are compared with the parameters in a reference signature record, or personal signature profile, which is based on data produced during a number of signatures, to determine whether the signature is authentic (i.e., signature by the authorized signatory) or forged.

For purposes of the present invention, a digitizer refers to any device which converts a location on an X,Y tablet, possibly with the angle of the pen and the pressure on the pen, to a numerical value, and an electronic pen is any device by which a person can write or sign on a digitizer tablet such that parameters of his handwriting can be detected by the digitizer. It will be appreciated that the system can be used to authenticate the handwriting of any predetermined word or words for which a reference record is made. Since the most common words used to identify a person are his signature, the present application refers to signatures, by way of non-limiting example, only.

It will be appreciated that there are many instances when it is desirable to authenticate the signature of a signatory, both in legal and business matters. The invention will be described hereinbelow with relation to credit cards, for which it is particularly suitable, by way of example only, but those skilled in the art will appreciate that it can also be applied in any other instance of signature verification where the system components can be made available.

When transmitting the signature over transmission lines for acceptance, as by a bank or credit card company, additional security can be provided by encrypting the signature with a secret key, known only to the signatory and the bank, which cannot be determined by downloading the data containing the signature signals from the transmission line.

Referring now to Fig. 1, there is shown a schematic illustration of a system for authenticating a signature

constructed and operative in accordance with one embodiment of the invention. The system includes a digitizer 10 with an associated electronic pen 12 coupled to a computer 14 for authenticating a signature at the time and place of signature. This system is particularly suitable for point of sale use. Digitizer 10 can be any conventional digitizer, such as a Wacom Digitizer, manufactured by Wacom Co. Ltd., Japan.

The signatory carries an Integrated Chip (IC) card, or smart card 15 on which is stored a reference signature record, or personal signature profile, for the signatory. Computer 14 includes a comparator 17, which compares the signature to be authenticated with the reference signature record stored on IC card 15. If the signature is within predefined tolerances of the reference signature, comparator 17 sends an accept signal to computer 14. If the signature is not within the predefined tolerances of the reference signature, comparator 17 sends a reject signal to computer 14.

Referring now to Fig. 2, there is shown a schematic illustration of a system for authenticating a signature constructed and operative in accordance with an alternative embodiment of the invention. The system includes a digitizer 10′ with an associated electronic pen 12′ coupled to a computer 14′ having a modem (not shown) for transmitting data from computer 14′ to a remote location 16, generally a bank or credit card company in the present example.

At remote location 16, the data is received by a dynamic identification unit 20 arranged to receive the data produced during signature by the electronic pen on the digitizer tablet and calculate therefrom a table of parameters which constitutes a signature record. The result is provided to a comparator 22 which compares the signature to be authenticated with a reference signature record, or personal signature profile, stored in its memory 24. If the signature

is within predefined tolerances of the reference signature, comparator 22 sends an accept signal to computer 14'. If the signature is not within the predefined tolerances of the reference signature, comparator 22 sends a reject signal to computer 14'.

Operation of the system of the invention is as follows. First, a reference signature record, or personal signature profile, must be provided for the bank or credit card company or other body which must accept or reject the signature, as shown in Fig. 2. This is done at the time of opening an account or requesting a credit card. The user signs his name on a digitizer tablet coupled to the computer of the credit card company. The pen position over the tablet is recorded by the computer to produce vectors, and a mathematical analysis is performed to learn the following parameters at any given time during the signature process:

pen position (X,Y coordinates) over the tablet;

sequences of drawing: number of letters, relative position, and time to draw;

acceleration and deceleration during signature;

direction changes.

Optionally the computer can also calculate pen tilt relative to the tablet and pen pressure, if the digitizer used is capable of providing this data. The digitizer data of the signature are input 30 to the dynamic identification unit in the computer. The dynamic identification unit records 32 the parameters of the signature. The recorded parameters are arranged 34 in a table of parameters. This process is repeated 36 a predetermined number of times, for example between 5 and 10, so as to permit the dynamic identification unit to calculate the tolerances 38 associated with the variations in the individual's signature, which is never identical. It will be appreciated that the range of acceptable variations in a personal signature profile will vary from person to person. Once the parameter table and

tolerances have been determined, these are stored in the computer memory for later reference as the reference signature record. It will be appreciated that, preferably, the personal signature profile consists of an array of parameters and logical tolerances or permitted variations, not an "average" signature.

A personal ID code is also recorded 39 together with the signature vector table. This personal ID code serves as an encryption key to provide additional security for signature data transmitted over transmission lines. This encryption key can be any string selected by the user which is known only to him and the credit card company. While the password selected by the credit card company, which is used in cash machines, etc. in conventional credit card authentication systems, can be used as the encryption key, it is preferable to select a key which does not appear on the card. One example of a suitable encryption key is the user's birthdate.

It is a particular feature of the invention that the dynamic identification unit will recognize a person's signature even if it is signed upside down (i.e., where the cardholder is in front of a counter) or rotated to any other angle, where the signature is smaller or larger in size, or slightly different in details.

At the time of making a credit card purchase, the purchaser's signature is authenticated as follows, as shown in Fig. 3. The customer signs with an electronic pen on a digitizer tablet in the store or on the digitizer tablet coupled to his home computer. The record of the signature is received 40 by the credit card company. The dynamic identification unit retrieves 42 the reference signature record of the cardholder. It may also retrieve 44 the personal ID code of the cardholder from the company computer if the signature is encrypted with the personal ID code. Generally this is necessary when making purchases other that at point of sale. If the record of the signature was

encrypted (described in detail hereinbelow) the record is now decrypted 46. If no recognizable signature record is received 48, the signature is rejected.

If the decryption results in a recognizable signature record, or if the signature record was not encrypted, the dynamic identification unit proceeds to identify the signature 50, as shown in detail in Fig. 4. The dynamic identification unit traces 52 the vector lines in the signature record and fills a parameter table 54 with the various parameters. The parameter table of the signature record is compared 56 with the reference parameter table stored in the computer memory.

Parameters for comparison are selected, for example, from the characteristics listed above. Any or all may be selected for use by the programmer. For example, the comparator can determine whether there is a significant difference in time of writing the signature 58, which could indicate copying rather than an authentic signature. It can determine whether there is a difference in the number of vectors 60, i.e., whether a letter has been added or omitted. It can look for a change in the angle of the pen 62. It can determine whether there is a change in the relative direction of the signature 63. And it can determine whether there are differences in pressure during signing 64. If any of the examined parameters is significantly different, i.e., outside the range of tolerances 66 (Fig. 3), the signature will be rejected. If the signature record meets all the characteristics of the reference signature record, the signature will be authenticated and accepted. An indication of acceptance is then sent to the point of purchase.

When making transactions at the point of sale, generally the physical lines are sufficiently secure that no encryption is required, although it can be used, if desired. However, for transactions over the Internet, encryption is recommended to prevent theft of the credit card details. In this case,

the Web surfer will have his own digitizer tablet coupled to his computer. After typing in the credit card number, as in conventional credit card purchases over the net, a signature authentication software driver will pop an input window to the cardholder's screen. The cardholder will type his personal ID code and then sign his name on the digitizer tablet. The vectors produced during signature on the digitizer tablet are calculated and the software encrypts the signature data using the personal ID code as the encryption key, as known.

The encrypted signature record is sent to the vendor, which may be a site on the Internet. The vendor forwards the signature record, as is, to the credit card company for authentication of the signature. When the encrypted signature record reaches the credit card company, it is authenticated as described above with reference to Figs. 3 and 4. When the reference signature data of the cardholder is retrieved, the encryption key is also retrieved, permitting the dynamic identification unit to decrypt the signature record and compare it with the reference signature. In accordance with the results of the comparison, the credit card company will notify the vendor that the signature is accepted or rejected.

Preferably, the authenticating computer will include means for detecting hacking. For example, if two identical signatures are received, one after another, the computer is preferably programmed to reject the second signature, even if it falls within the personal signature profile. This is because, in real life, no one signs his or her name exactly the same way twice in a row.

On the other hand, over time, a person's signature tends to change. Therefore, according to a preferred embodiment of the invention, updating means is provided for changing the personal signature profile or reference signature record, in accordance with perceived, consistent changes in the

signature. A flow chart of one example of suitable software for accomplishing this updating is illustrated in Fig. 6.

In Fig. 6, the comparator receives the signature for authentication and compares it with the personal signature profile (block 70). If the result is not close to the edge of the tolerances or permitted variations, the comparator exits the program (block 72). If the result is close to the edge of the tolerances or permitted variations, an invalid counter is incremented by one (block 74). The counter is checked (block 76) and, if the result is less than a pre-selected number, e.g. 5, the comparator exits the program (block 78). If the results equals the pre-selected number, the old signature is replaced by the new signature (block 80), and the Tolerance Table is rebuilt to include the new signature parameters and permitted variations (block 82). At the same time, the Invalid Counter is cleared.

According to another embodiment of the invention, the signature authentication is utilized for network access, instead of a password. In this embodiment, the personal signature profile is provided to the network, in lieu of a personal password. When access to the network is desired, the user signs a digitizer coupled to his workstation, and the signature is compared with the personal signature profile. This method greatly increases security within the network, by preventing access to a hacker who discovered the password by unauthorized means, or to an unauthorized person who was given the password.

It will be appreciated that the invention is not limited to what has been described hereinabove merely by way of example. Rather, the inventon is limited solely by the claims which follow.

CLAIMS

1. A system for authenticating a signature comprising:

(a) a digitizer and associated electronic pen ;

(b) a dynamic identification unit for receiving data from said digitizer produced during signature by said electronic pen on said digitizer, calculating signature parameters and permitted variations from said data, and generating a reference signature record therefrom;

(c) a comparator for comparing said received parameters produced during signature with said reference signature record; and

(d) apparatus for providing an accept or reject response in accordance with the output of said comparator.

2. The system according to claim 1, further comprising:

a transmitter for transmitting said calculated signature parameters for authentication; and

a receiver for receiving said transmitted signature parameters, said receiver being coupled to said comparator.

3. The system according to claim 2, wherein:

(a) said system further includes an encryptor for encrypting said measured parameters to provide an encrypted signature record; and

(b) said dynamic identification unit further includes a decoder for decoding said encrypted signature record.

4. The system according to claim 1, wherein said reference signature record is stored on an IC (integrated chip) card.

5. The system according to any of claims 1 to 3 for authenticating a signature transmitted over a transmission line comprising:

(a) a vendor unit including:

(1) a digitizer and associated electronic pen; and

(b) a signature authorization unit coupled to said vendor unit by the transmission line and including:

(1) a dynamic identification unit for receiving data from said digitizer produced during signature by said electronic pen on said digitizer, calculating signature parameters therefrom, and generating a reference signature record corresponding thereto;

(2) a comparator for comparing said parameters produced during signature with said reference signature record; and

(3) apparatus for providing an accept or reject response to said vendor unit in accordance with the output of said comparator.

6. The system according to claim 2 or 3 for authenticating a signature transmitted over communication transmission lines comprising:

(a) a cardholder unit including:

(1) a digitizer and associated an electronic pen;

(2) apparatus for transmitting the output of said digitizer over the communication transmission lines;

(b) a signature authorization unit including:

(1) a dynamic identification unit for receiving data from said digitizer produced during signature by said electronic pen on said digitizer, calculating signature parameters therefrom, and generating a reference signature record corresponding thereto;

(2) a comparator for comparing said parameters produced during signature with said reference signature record; and

(3) apparatus for providing an accept or reject response in accordance with the output of said comparator; and

(c) a vendor unit coupled to said cardholder unit and to said signature authorization unit by the communication transmission lines and including a transceiver for receiving said output of said digitizer from said cardholder unit and transmitting it to said signature authorization unit; and for receiving said accept or reject response from said signature authorization unit.

7. The system according to any of the preceding claims, wherein said reference signature record includes an array of signature parameters and permitted variations.

8. The system according to any of the preceding claims, further comprising means for updating said reference signature record.

9. A method of authenticating a signature including the steps of:

(a) providing a reference signature record;

(b) signing with an electronic pen on a digitizer tablet;

(c) calculating signature parameters from data received from said digitizer produced during signature by said electronic pen on said digitizer;

(d) comparing said parameters produced during signature with said reference signature record; and

(e) providing an accept or reject response in accordance with results of the comparison.

10. The method according to claim 9, and further including the steps of:

(a) encrypting said calculated parameters with a encryption key after said step of calculating; and

(b) decrypting said encrypted parameters before comparing said parameters.

11. The method according to claim 9, wherein said step of providing a reference signature record includes:

(a) writing the signature on said digitizer several times;

(b) calculating signature parameters for each signature;

(c) calculating permitted variations of said signature parameters; and

(d) storing said signature parameters and said permitted variations as a reference signature record.

12. The method according to any of claims 9 to 11, further comprising updating said reference signature record.

SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES

Abstract of the Disclosure

A system and method for authenticating a signature, the system including a digitizer and associated electronic pen, a dynamic identification unit for receiving data from the digitizer produced during signature by the electronic pen on the digitizer, calculating signature parameters and permitted variations from the data, and generating a reference signature record therefrom, a comparator for comparing the received parameters produced during signature with the reference signature record, and apparatus for providing an accept or reject response in accordance with the output of the comparator.

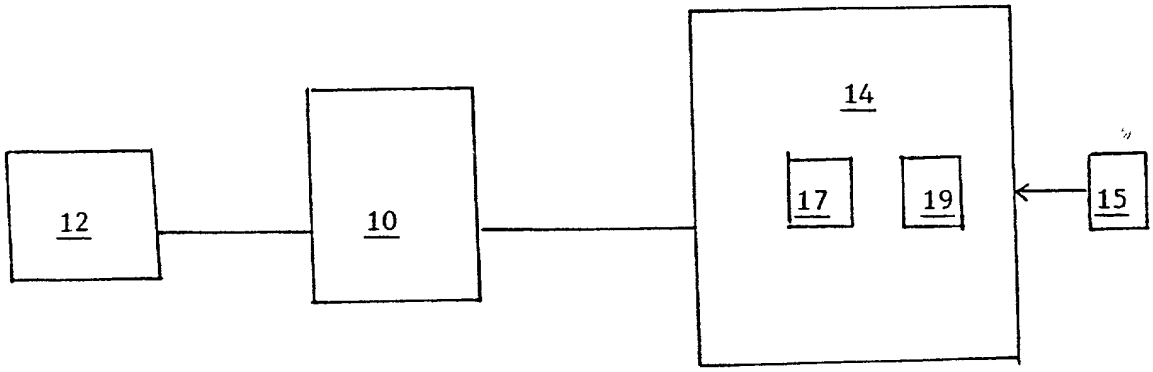

FIG. 1

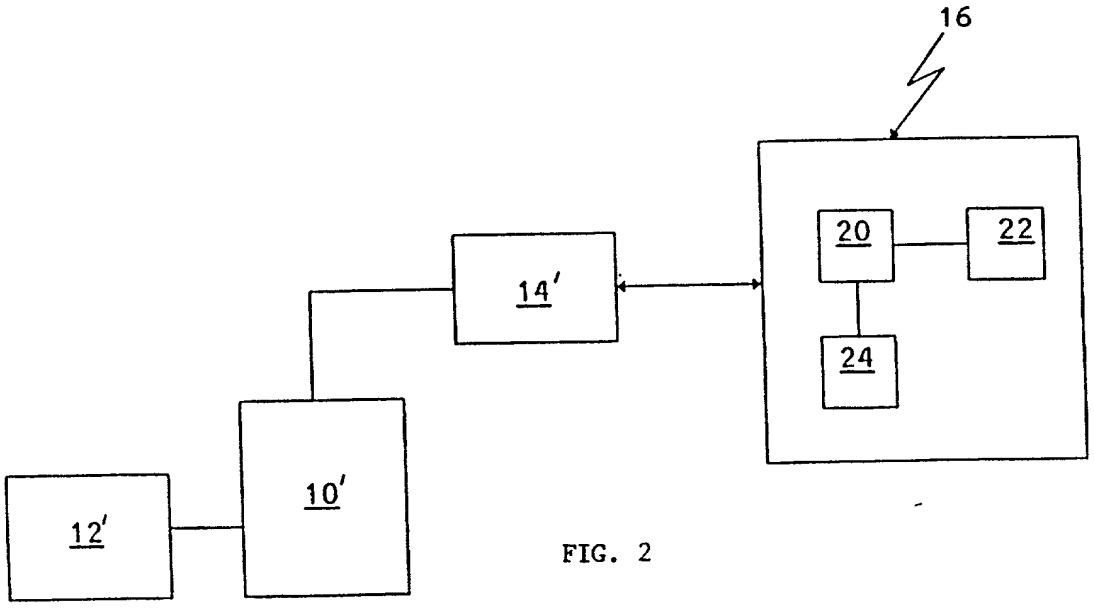

FIG. 2

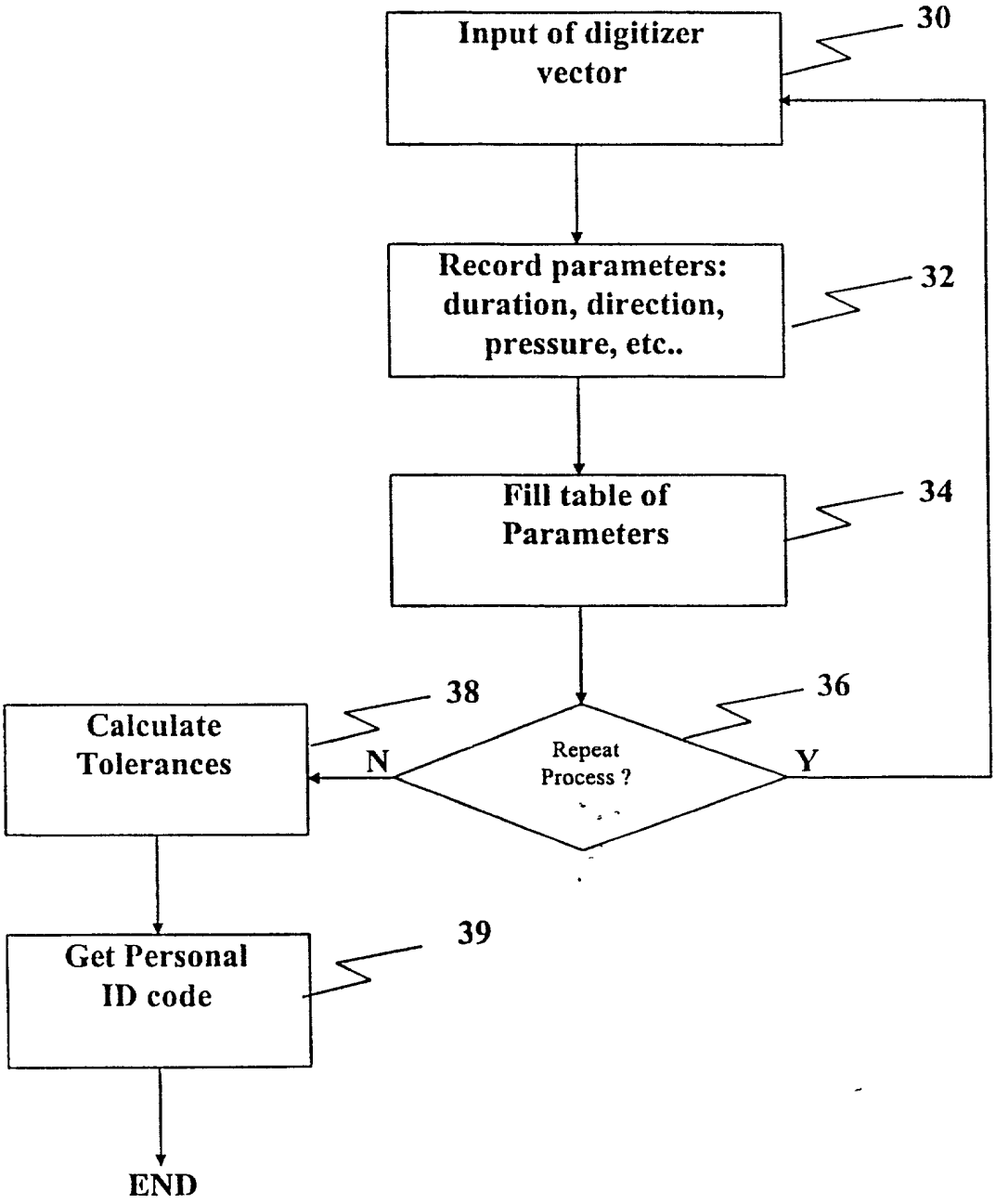
Input of digitizer vector
30
Record parameters: duration, direction, pressure, etc..
32
Fill table of Parameters
34
Repeat Process ?
36
N
Y
Calculate Tolerances
38
Get Personal ID code
39
END

Fig. 3

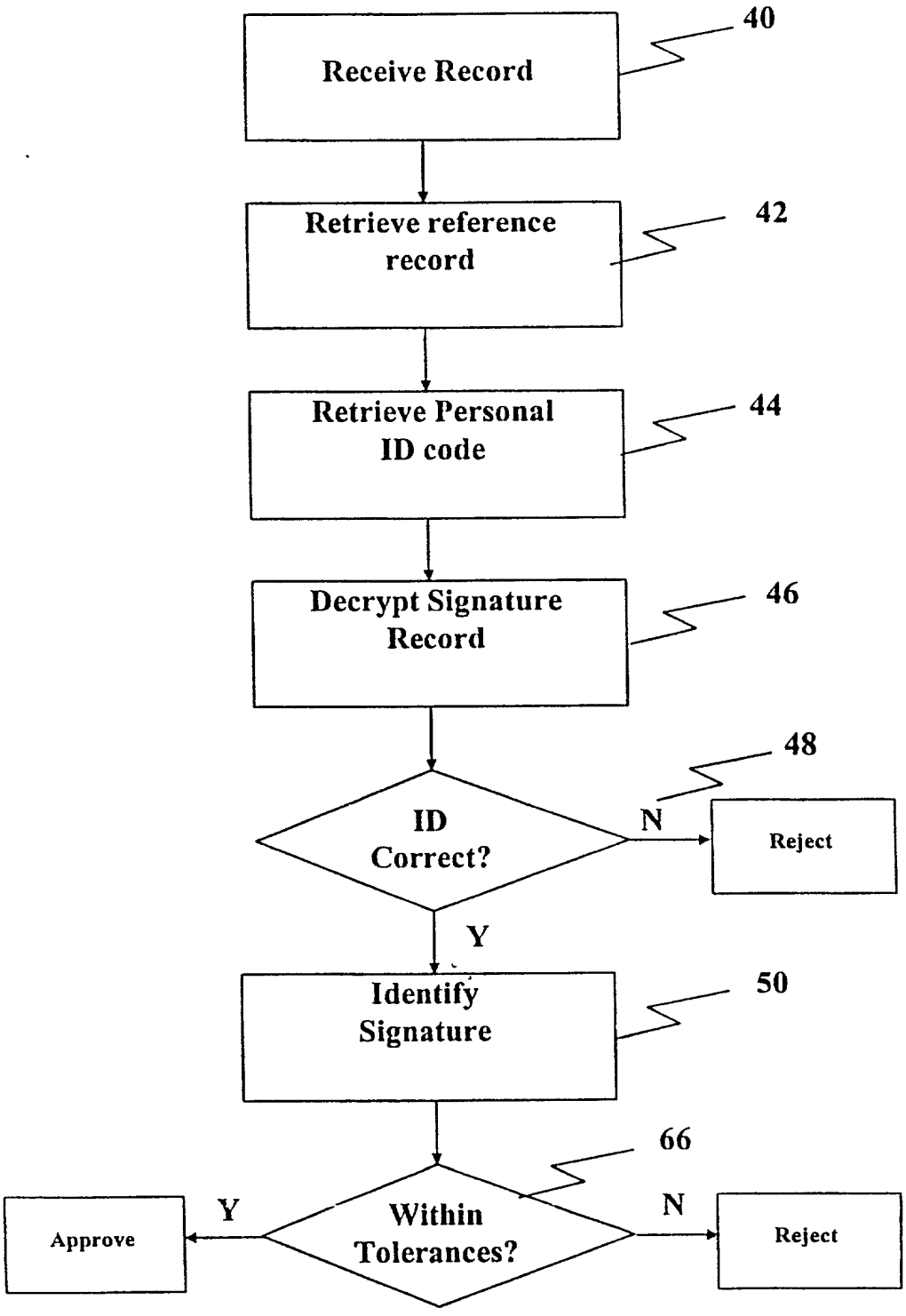
Receive Record
40
Retrieve reference record
42
Retrieve Personal ID code
44
Decrypt Signature Record
46
ID Correct?
48
N
Reject
Y
Identify Signature
50
Within Tolerances?
66
Y
Approve
N
Reject

Fig. 4

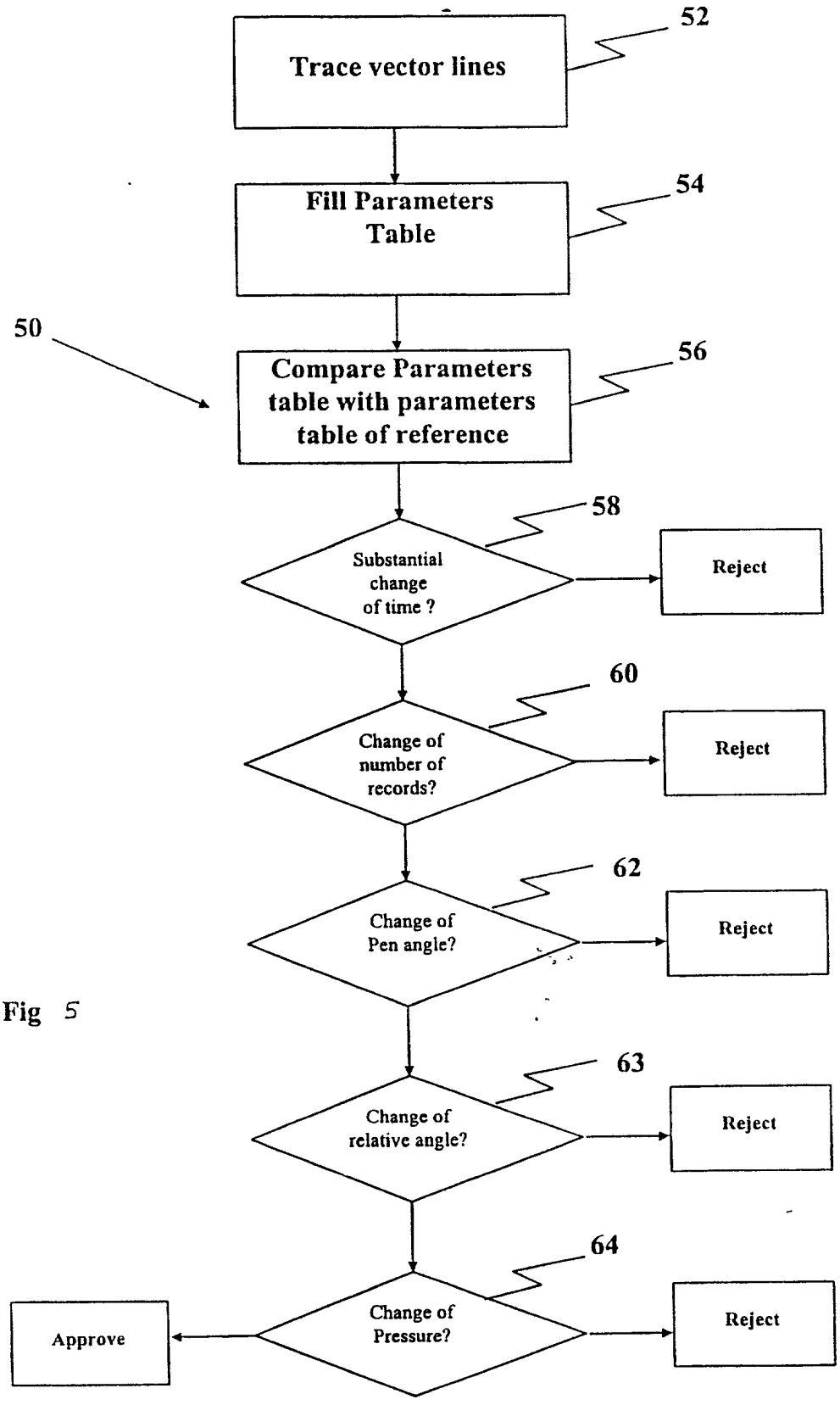
Trace vector lines
52
Fill Parameters Table
54
50
Compare Parameters table with parameters table of reference
56
58
Substantial change of time ?
Reject
60
Change of number of records?
Reject
62
Change of Pen angle?
Reject
63
Change of relative angle?
Reject
64
Change of Pressure?
Reject
Approve

Fig 5

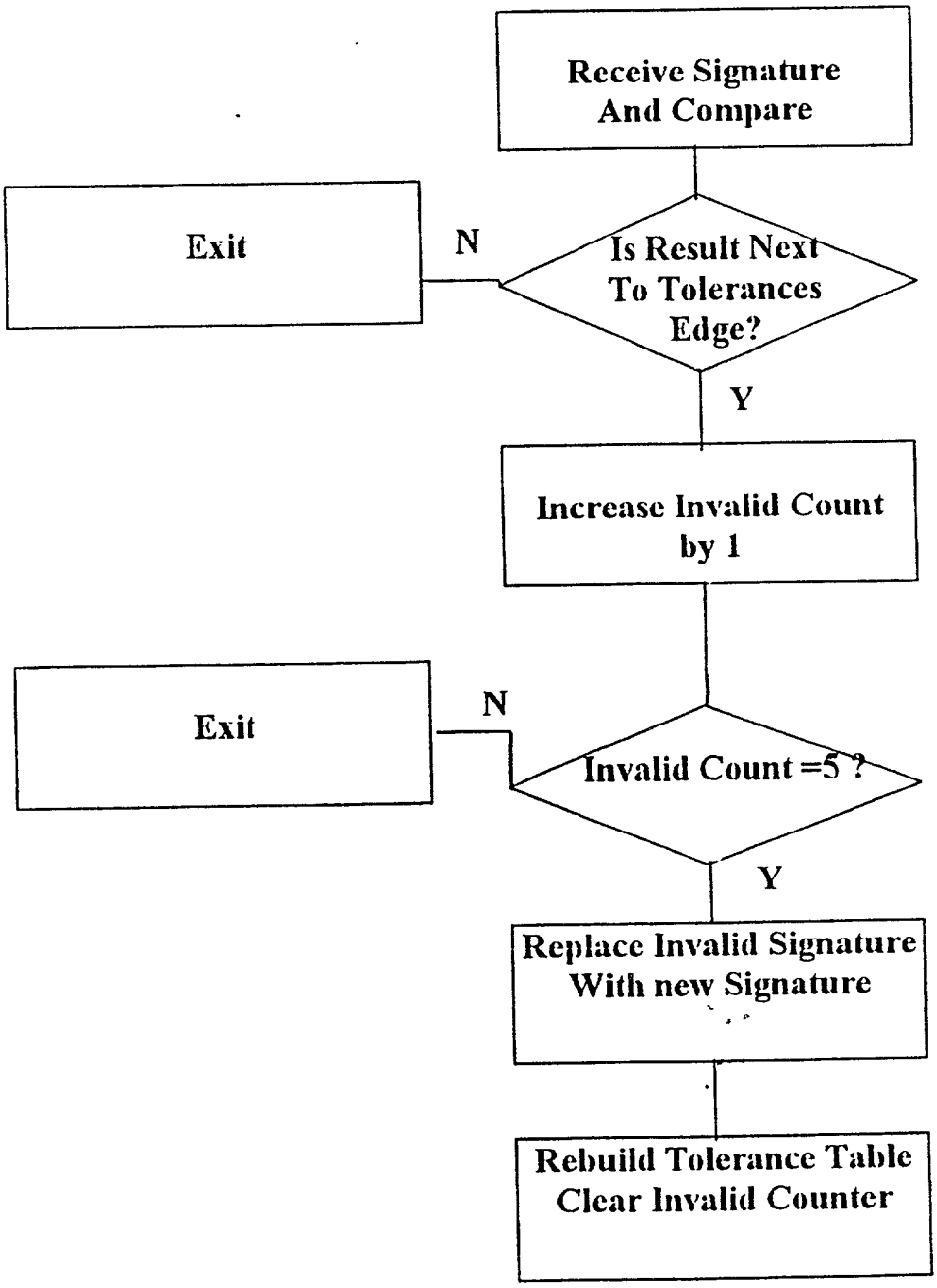
Receive Signature And Compare
Is Result Next To Tolerances Edge?
N
Exit
Y
Increase Invalid Count by 1
Invalid Count =5 ?
N
Exit
Y
Replace Invalid Signature With new Signature
Rebuild Tolerance Table Clear Invalid Counter

Fig. 6

COMBINED DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below-named inventor, I hereby declare that:

My residence, post office address, and citizenship are as stated below next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled **SYSTEM AND METHOD FOR AUTHENTICATING SIGNATURES**, the specification of which

[ ] is attached hereto.

[X] was filed on July 23, 1998 as PCT International Application No. PCT/IL98/00342 and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information that is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code § 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application, to file any corresponding international application(s), and to transact all business in the Patent and Trademark Office connected therewith:

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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